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# Six-month follow-up of a primary care managed weight loss program for overweight and obese African-American women

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# SIX-MONTH FOLLOW-UP OF A PRIMARY CARE MANAGED WEIGHT LOSS PROGRAM FOR OVERWEIGHT AND OBESE AFRICAN-AMERICAN WOMEN

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# ABSTRACT

Obesity is the number one public health concern in the United States, and is more prevalent in African-American women and those from lower socioeconomic groups. However, many primary care physicians do not feel confident in their ability to assist patients in weight management. Thus the challenge for physicians is to provide patients better assistance with weight management. The purpose of the study was to examine the efficacy of a primary care-managed weight loss program on weight reduction and cardiovascular fitness in overweight/obese women. Participants were randomized to intervention (n=54; Age: 44±12yrs) or standard care (n=62; Age: 44±12yrs) and followed for 6 months. Intervention included monthly physician visits to address issues concerning diet, exercise, barriers, and motivation. Those in intervention experienced moderate weight loss after 6 months (Intervention: 216.89 ± 48.38 to 208.86 ± 42.11; Standard Care: 222.01± 37.67 to 221.95± 38.81, p=0.004). However, further analysis revealed the magnitude of weight loss appears to be dependent on the physician responsible for the delivery (average weight change: MD1: -0.44; MD2: -4.97; MD3: -7.43; MD4: 0.25 lbs.). Pearson correlation coefficients revealed the magnitude of weight loss was significantly associated with a change in waist circumference (r=0.42, *p*=0.001), 1-min heart rate recovery (r=0.25, *p*=0.03), and systolic blood pressure (r=0.26, *p*=0.02). In conclusion, this study reports a moderate weight loss following a physician directed program in overweight/obese women from lower socioeconomic groups. Independent of intervention moderate weight loss was associated with a reduction in other cardiovascular risk factors including BMI, heart rate recovery, blood pressure, and waist circumference.

# CHAPTER 1 - INTRODUCTION

The worldwide prevalence of obesity is increasing at such a rapid pace that the World Health Organization (WHO) consultation on obesity designated obesity as the major unmet public health concern in the world (Hill, Holly, Wyatt, and Melanson 2000). An estimated 97 million adults in the United States are either overweight or obese (Obesity Research, 1998). Those classified as over-weight and obese are especially evident in certain minority groups, such as African-Americans, and those from lower socio-economic backgrounds. The highest prevalence of obesity is seen in African-American women, with 69% of this population being overweight or obese (Allison and Saunders, 2000).

Obesity is a complex multi-factorial chronic disease that involves the integration of social, behavioral, cultural, environmental, physiological, metabolic, and genetic factors (Obesity Research, 1998). Clinically, a BMI of 25-29.9 is considered overweight. A BMI of 30 or greater is indicative of obesity (Flegal, Carroll, Kuczmarski, and Johnson, 1998). Research has shown that a BMI of 25 or greater has been strongly associated with increased risk of a large number of disorders and diseases including but not limited to dyslipidemia, type II diabetes mellitus, hypertension, coronary artery disease, congestive heart failure, osteoarthritis, cancer such as breast cancer in women and colon cancer in men, sleep apnea, gallstones, and depression (Allison, et al, 2000).

Treatment interventions include pharmacological treatment, surgical approaches, dietary interventions, behavioral treatment, as well as exercise program strategies. Despite these treatment strategies, none have individually shown significant success in achieving weight loss that is long term and safe (Hardeman, Griffin, Johnston, Kinmonth, and Wareham, 2000). Exercise, more than any other treatment strategy results in more effective long-term weight loss when individually implemented (Hardeman et al., 2000). It is known that exercise promotes the expenditure of energy; therefore, programs that focus on physical activity and in promoting a negative energy balance and achieve subsequent weight loss. Furthermore, studies have revealed that in obese women, physical activity promotes benefits other than weight loss, including improvements in bone metabolism, glucose tolerance, and lipid metabolism. Further studies have reported, though weight reduction may have only been moderate, exercise alone has been shown to produce moderate-to-large losses in body fat, and small-to-moderate gains in lean body tissue (Zachwieja, 1996). Additionally and importantly, even if body weight is not significantly reduced with exercise, it has been shown that incidences of such conditions as coronary heart disease, diabetes mellitus, and hypertension are significantly lowered in obese individuals who exercise (Blix, G., and Blix, A. 1995).

Regardless of the benefit of one strategy for weight loss clearly a multi-disciplinary approach to weight loss is crucial in the management of this disease. Muli-disciplinary programs should include dietary management, pharmacological treatment, exercise prescription, and psychological counseling. Yet, more in depth and thorough research is needed in order to assess the most beneficial components of these multi-disciplinary approaches and also to assess proper timing of implementing these interventions (Hardeman, et al, 2000).

Despite the fact that many overweight individuals report trying to lose weight on their own by use of commercial programs, obesity still continues to drastically rise (Simkin-Silverman and Wing, 1997). This is an indicator that the greater part of the population wants to lose weight but do not have the ability or means to do so. Though there is evidence that supports the use of a multi-disciplinary program to achieve weight loss, a major influence in these programs is the physician's knowledge of how to implement obesity treatment strategies (Simkin-Silverman, et al., 1997). More importantly, there are few such programs available at the primary care level for weight reduction in the obese. Many primary care physicians do not have the ability to treat overweight and obese patients, citing lack of time, patient non-compliance, inadequate teaching materials, lack of counseling training, inadequate reimbursement, and low physician confidence as barriers to treatment (Bowerman, Bellman, Saltsman, et al., 2001). Because of this, physicians do not appear to focus on the treatment of the disease. Consequently, the patient-physician relationship deteriorates further adding to perceived biases, patient's frustrations and lack of confidence in the medical industry. In contrast, estimates that approximately 75% of adults visit a physician about 5 times a year and in samples of low income minority primary care patients, 3-8 visits per year is common (Martin, Rhode, and Brantley, 1998). It would appear the potential is there to address many issues regarding behavior through progressive, perhaps multi-disciplinary strategies. Minorities, women, and individuals from lower socioeconomic levels, in particular, have not been adequately studied to understand many barriers concerning weight loss strategies.

## Study Purpose

### Primary Care Directed Weight loss

The present study was designed to examine the efficacy of a primary care multi-disciplinary weight loss program to reduce weight in overweight and obese African-American women of lower socio-economic status. It is hypothesized that the primary care physician based weight loss intervention model will result in significant weight loss and will be associated with improved cardiovascular risks profiles such as decreased blood pressure, increased fitness measures, and decreased BMI.

### Relation of Change in Weight to other Factors

A secondary purpose of the study was to determine if the magnitude of weight loss was associated with the magnitude of change in an individual's risk profile. The physiological parameters measured included waist circumference, recovery heart rate, and blood pressure. It was hypothesized that those individuals who did lose the greater amounts of weight would also experience greater improvements in the other parameters.

**Possible Predictors of Successful Weight Loss**

A final purpose of the study was to determine if certain initial characteristics, such as baseline BMI, heart rate recovery, and blood pressure, could predict overall success of weight loss achieved. It was hypothesized that those individuals, who possessed a lower initial BMI, lower initial recovery heart rate, and lower initial blood pressures, would achieve greater weight loss success.

# CHAPTER 2 - METHODOLOGY

## Study Participants

Women between the ages of 18 and 65, with BMI $\geq$ 25 without additional overt manifestation of disease, or those who were well-controlled as determined by the primary physician against hypertension, diabetes and hyperlipidemia were recruited for the study. Exclusion criteria included pregnancy or lactation, history of a psychiatric illness, alcohol intake of greater than 14 drinks/week, serious illness which may have interfered with dietary or physical activity compliance, current involvement in a physician-recommended dietary plan, or presence of a current major depressive episode which may have biased self-report measures.

## Experimental Design

A randomized, prospective, two-arm treatment study was designed to examine the effects of standard care versus intervention in regard to weight management and fitness measures. The participants were distributed between two sites and 8 physicians (4 physicians at each site). All participants were assessed at the beginning of the study (baseline) and again at six months following enrollment. Subjects enrolled in the intervention arm received six individualized counseling sessions for weight management. The interventions were given by a physician who received specific pre-study counseling regarding general obesity treatment guidelines, information about treating obesity via diet, exercise, behavior counseling, pharmacotherapy, surgery, and motivational interviewing, behavior therapy, dietary recommendations, and food preference.

## Experimental Measurements

### Baseline and Six-Month Data Collection

The study began with a 1-month baseline period during which data was collected. The level of motivation, food preferences, and current status of dietary and exercise patterns were assessed at both baseline and six-months. Weight, body mass index (BMI), and waist measurements were also recorded at these times.

Physical activity habits were evaluated using two instruments: (1) a 7-day Physical Activity Recall Questionnaire, and (2) the Baecke Questionnaire of Habitual Physical Activity (Pereira et al. 1997). Cardiorespiratory fitness was assessed using the YMCA 3-minute step test protocol (Golding et al. 1998). A Polar heart rate monitor was used to allow for heart rate monitoring during the test. Subsequently, resting, seated and standing blood pressures and heart rates were recorded. Participants were then asked to perform the step test with the goal of at least 15 steps per minute. Heart rate and Borg's Rating of Perceived Exertion (1982) were recorded once per minute during the stepping protocol. Immediately following the test, the participant was seated and a one-minute-post-exercise heart rate was obtained. The one-minute recovery heart rate represented the measure of cardiovascular fitness (McArdle et al. 1972). Heart rate and blood pressure were then measured at 2, 3, 4, 5, 7, and 10 minutes post-exercise.

**Physician and Staff Training**

Physician training included three sessions at Pennington Biomedical Research Center by the study's principal investigators. Physicians providing standard care received only the first introductory training session during which general obesity treatment guidelines were reviewed. Specifically, this session included information about treating obesity via diet, exercise, behavior counseling, pharmacotherapy, and surgery. The only educational materials the standard care physicians were provided were the NHLBI (1998) guidelines and they provided their current standard of care. Physicians providing the intervention underwent two additional sessions. Topics covered in these sessions included the motivational interviewing, behavior therapy, dietary recommendations, and food preference.

### Intervention

Following the baseline period, the intervention participants entered the active phase of the study. This phase consisted of six monthly physician-counseled office visits. A length of six months was chosen because this amount of contact time approximated time requirements of previous studies employing physician directed change programs (Ockene et al. 1995) and the optimal time recommended for dietary therapy. Subjects assigned to the standard care group did not receive any special instructions and were seen as advised by their physician.

#### Content of Physician Visits

##### Diet

Participants were instructed by their physicians to adapt their diet to include low-fat foods and increased amounts of fruits and vegetables and to consistently follow the food guide pyramid. Instructional materials were culturally appropriate, and included dietary guidelines, food guide pyramid, and healthy menu patterns.

##### Physical Activity

Intervention participants were advised by their physicians on incorporating lifestyle activity into their daily routines, such as taking the stairs and increasing their physical activity level around the house. Additionally, all subjects received recommendations to begin a physical activity program based upon their current activity levels. Those participants who were sedentary were encouraged to start with 15 minutes of walking per session 3 or more days per week (NHLBI 1998). Those who were already engaged in regular physical activity were encouraged to gradually increase the frequency, duration, and intensity of their current programs. Each month, participants were asked to gradually increase their physical activity level by adding time and/or and intensity to their walks (NHLBI 1998). A monthly newsletter contained general physical activity tips along with tailored physical activity tips. Tailored tips were customized according to subjects' self-reports of adherence to the previous month's tips.

**Statistical Analysis**

All data analyses were conducted using the SPSS System.

**Primary Care Directed Weight Loss**

To determine the efficacy of the intervention to elicit weight loss was analyzed by use of two by two statistics. The analysis was categorized by two groups (intervention and standard care) and two measures (pre and post). Group statistics were run for pre and post values on both groups of the study. Independent sample t-tests were also used on these groups to determine if significant relationships existed between the groups at baseline and six-months. Within- and between-group paired-sample t-tests were implemented to determine the effectiveness of the intervention for body weight, waist circumference, blood pressure, peak heart rate, and one-minute recovery heart rate. Further, group statistics and means were also run on serial blood pressures for ten minutes of recovery following the initial and six-month step test.

**Relation of Change in Weight to other Factors**

Pearson Product Moment correlations were used to assess relationships between changes in weight to other physiological parameters including BMI, waist circumference, heart rate recovery, and blood pressure.

**Possible Predictors of Successful Weight Loss**

To examine the influence of certain factors, which may influence the success of weight loss, individuals were classified according to initial fitness level, BMI, and hemodynamic values. Subsequently, these categories were analyzed by way of an ANOVA to determine differences of the magnitude of weight loss. Statistical significance was set at $p < 0.05$.

# CHAPTER 3- RESULTS

**Baseline Characteristics**

One-hundred and sixteen women between the ages of 18 and 65 years, with BMI $\geq 25$ participated in the study. Baseline characteristics for age, weight, BMI, waist circumference, blood pressure, and heart rate measures are expressed in Table 1. No baseline differences were observed between the two groups except for diastolic blood pressure (79.92±12.4 and 86.03±12.63; $p$ = 0.012) and resting heart rate (69.79±9.06 and 74.10±11.57; $p$ = 0.033), with the standard care group exhibiting higher values. At baseline both groups exhibited similar measures of fitness with values of heart rate peak after a three minute step test measuring 136 beats per minute for the intervention group and 140 beats per minute for the standard care group. Further, no significant differences were found between groups for one-minute heart rate recovery at the completion of the step (106±17 and 107±16). Also, serial blood pressures were recorded for ten minutes after the completion of the step test. Table 4 and Figure 7 depict the values obtained at rest, before the start of the step test, and for ten minutes following the step with both the intervention and standard care groups experiencing lower blood pressures after10-minutes of recovery than before exercise.

**Six-Month Characteristics**

Within and between group comparisons from baseline to 6-months are highlighted in Table 2, indicating an approximate 4-pound weight loss ($p$ = 0.004), in the intervention group. Moreover, those in the intervention group had an average decrease of 3.6 BMI units ($p$ = 0.035) with the standard care group gaining about 0.20 units. Graph 1 represents the weight loss differences between the two groups after six-months of involvement in the study. Graph 2 depicts the BMI differences between the two groups at the completion of the study. The loss of weight as seen in the intervention group is representative of about a 2% decrease in body weight. Further, nearly a 9.5% decrease in BMI was obtained. Comparisons of all other variables show no significant differences.

Serial blood pressures were also recorded at the month 6 visit after the completion of the step test. Tables 4 and 5 and Figures 7 and 8 depict the values obtained at rest and at six months, before the start of the step test, and for ten minutes following the step, again with both the intervention and standard care groups experiencing lower blood pressures after10-minutes of recovery than before exercise.

**Correlation of Change in Body Weight to other Physiological Parameters**

Further analyses of correlations of change in weight to other physiological parameters are represented in Table 3. These data show independent of intervention received, those individuals who lost more weight also had greater reductions in other health risks. This table indicates reductions in waist circumference ($p = 0.001$), heart rate recovery ($p = 0.028$) and systolic blood pressure ($p = 0.023$) were obtained in those with greater weight loss. Other parameters did not appear to be effected by weight reduction. Graphs 3, 4, and 5 indicate the relationships that are associated between change in weight and change in waist circumference, change in systolic blood pressure, and change in heart rate recovery.

**Predictors of Successful Weight Loss**

Possible predictors of successful weight loss, such as initial BMI, fitness status, as determined by heart rate recovery (both actual and absolute), and initial blood pressure, were assessed and analyzed. Individuals were grouped into one of three possible classes for each of the predictor categories. BMI class was grouped as either high, moderate, or low, which represented a BMI > 41, 35-40, or < 35 respectively. Actual heart rate recovery value was classified as highest (>122 bpm), moderate (108-122 bpm), or low (<108 bpm). Absolute heart rate recovery, which indicates the difference between peak heart rate achieved and heart rate after one-minute of recovery, was classified as lowest fit (0-25 bpm), moderately fit (26 – 36 bpm), and highest fit (>36 bpm). Finally blood pressure was classified into tertiles with a blood pressure of >142/90 representing the highest group, 125 – 141/ 78 - 89 characterized the moderate group, and <125/77 representing the group with the lowest pressures. Analysis of the predictor variables did not reveal any correlation between these variables and successful weight loss.

| **Table 1. Baseline Findings** | | | | | |
|---|---|---|---|---|---|
| | **Group 1 (Intervention) n= 54** | | **Group 2 (Standard Care) n = 62** | | **Between Group Comparisons** |
| | Mean | sd | Mean | sd | p-value |
| **Age (yrs.)** | 43.45 | 11.7 | 44.17 | 12.6 | 0.75 |
| **Weight (kg)** | 99.03 | 21.9 | 101.3 | 17.2 | 0.55 |
| **BMI (kg/m²)** | 38.0 | 8.3 | 39.1 | 7.4 | 0.48 |
| **Waist (cm)** | 106.4 | 15.1 | 112.7 | 14.5 | 0.07 |
| **SBP rest (mmHg)** | 131.1 | 16.3 | 135.1 | 17.4 | 0.23 |
| **DBP rest (mmHg)** | 79.8 | 12.5 | 85.9 | 12.8 | 0.01 |
| **HR rest (bpm)** | 69.7 | 9.2 | 74.1 | 11.7 | 0.03 |
| **HR peak (bpm)** | 136.8 | 17.3 | 141.8 | 19.8 | 0.30 |
| **1-min. Rec. HR (bpm)** | 105.7 | 17.1 | 106.5 | 14.8 | 0.79 |

| **Table 2. Within & Between Group Comparisons at 6-Months** | | | | | |
|---|---|---|---|---|---|
| | **Group 1 (Intervention) n= 54** | | **Group 2 (Standard Care) n = 62** | | **Between Group Comparisons** |
| | Mean | sd | Mean | sd | p-value |
| **Weight (kg)** | -1.69 | 3.64 | .205 | 2.99 | 0.004 |
| **BMI (kg/m²)** | -3.60 | 12.7 | .181 | 1.57 | 0.035 |
| **Waist (cm)** | -1.47 | 5.81 | -1.32 | 6.14 | 0.920 |
| **SBP rest (mmHg)** | 4.15 | 14.72 | 6.76 | 15.31 | 0.428 |
| **DBP rest (mmHg)** | 7.78 | 11.9 | 6.80 | 11.5 | 0.703 |
| **HR rest (bpm)** | 0.76 | 10.75 | 2.22 | 12.78 | 0.568 |
| **HR peak (bpm)** | 4.85 | 12.90 | .217 | 12.31 | 0.236 |
| **1-min. Rec. HR (bpm)** | 2.36 | 15.85 | 5.43 | 13.7 | 0.355 |

| **Table 3. Correlations of Δ Weight to other Physiological Parameters** | | | | | | |
|---|---|---|---|---|---|---|
| | **Δ WST** | **Δ HR rec** | **Δ SBP** | **Δ DBP** | **Δ MAP** | **Δ HR pk** |
| **Δ Wt** | .400 | .247 | .251 | .057 | .148 | .047 |
| **p-value** | .001 | .028 | .023 | .609 | .183 | .775 |

| **Table 4. Initial Blood Pressures at Rest and after Exercise** | | | | |
|---|---|---|---|---|
| | **Group 1 (Intervention)** | | **Group 2 (Standard Care)** | |
| | **Systolic BP (mmHg)** | **Diastolic BP (mmHg)** | **Systolic BP (mmHg)** | **Diastolic BP (mmHg)** |
| **Resting** | **131** | **80** | **135** | **86** |
| **Min.2 Rec.** | **154** | **76** | **159** | **81** |
| **Min.3 Rec** | **145** | **77** | **151** | **81** |
| **Min.4 Rec** | **139** | **76** | **143** | **80** |
| **Min.5 Rec** | **132** | **76** | **140** | **81** |
| **Min.7 Rec** | **127** | **76** | **133** | **81** |
| **Min.10 Rec** | **125** | **78** | **132** | **82** |

| **Table 5. Blood Pressures at Rest and after Exercise at Month 6** | | | | |
|---|---|---|---|---|
| | **Group 1 (Intervention)** | | **Group 2 (Standard Care)** | |
| | **Systolic BP (mmHg)** | **Diastolic BP (mmHg)** | **Systolic BP (mmHg)** | **Diastolic BP (mmHg)** |
| **Resting** | **135** | **88** | **140** | **92** |
| **Min.2 Rec.** | **157** | **83** | **167** | **86** |
| **Min.3 Rec** | **148** | **83** | **157** | **86** |
| **Min.4 Rec** | **141** | **83** | **148** | **86** |
| **Min.5 Rec** | **135** | **83** | **142** | **86** |
| **Min.7 Rec** | **132** | **84** | **137** | **87** |
| **Min.10 Rec** | **129** | **85** | **135** | **88** |

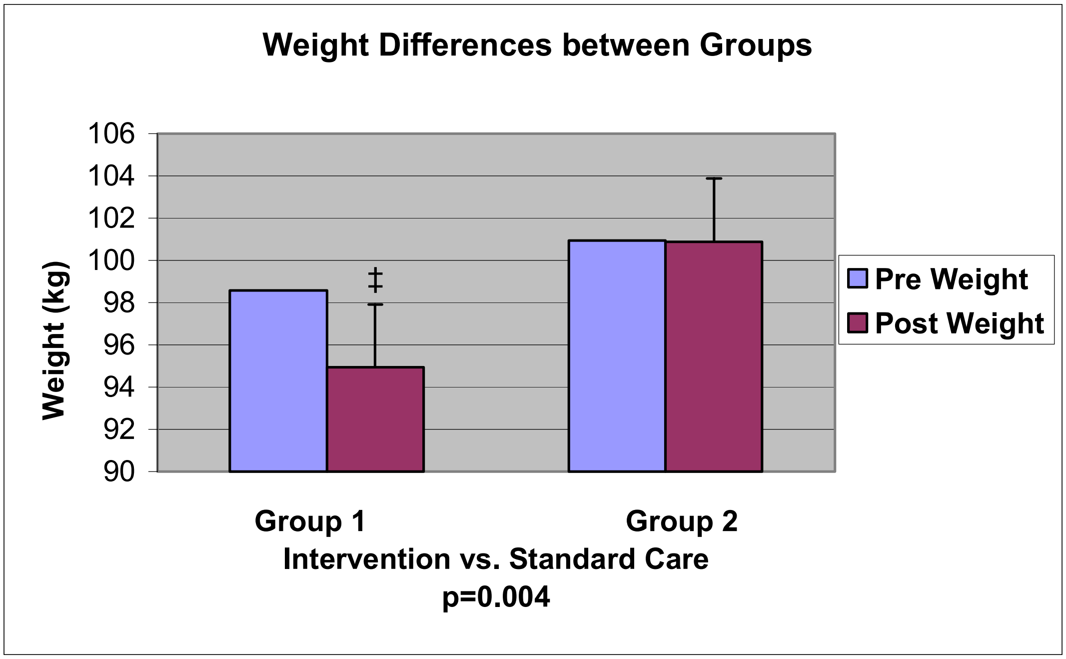


Figure 1. Weight differences between groups.

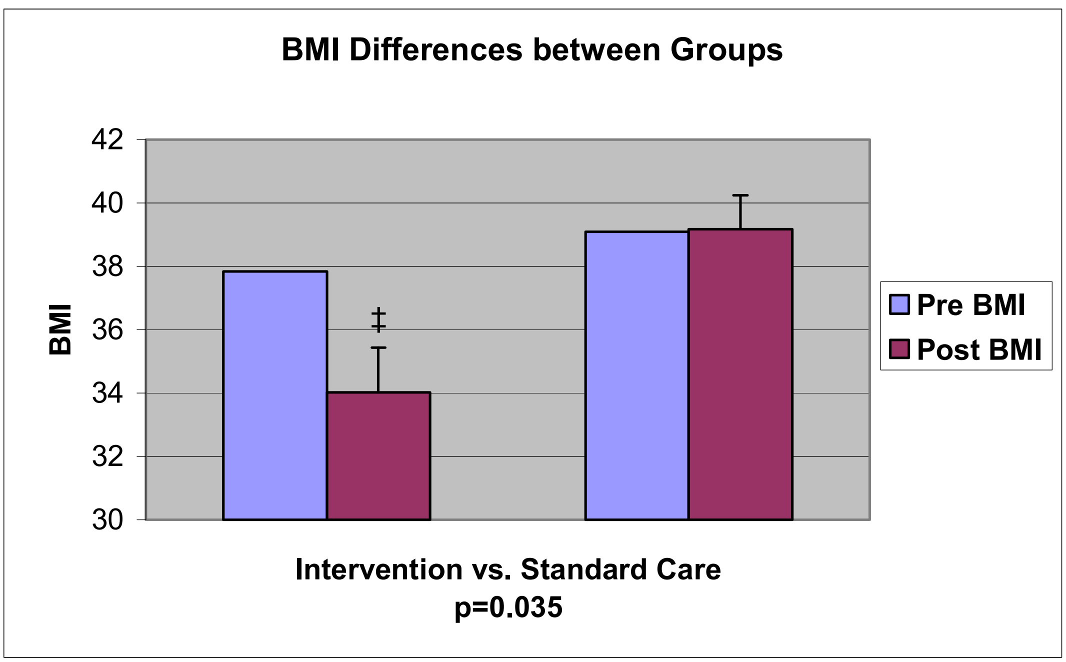


Figure 2. BMI differences between groups.

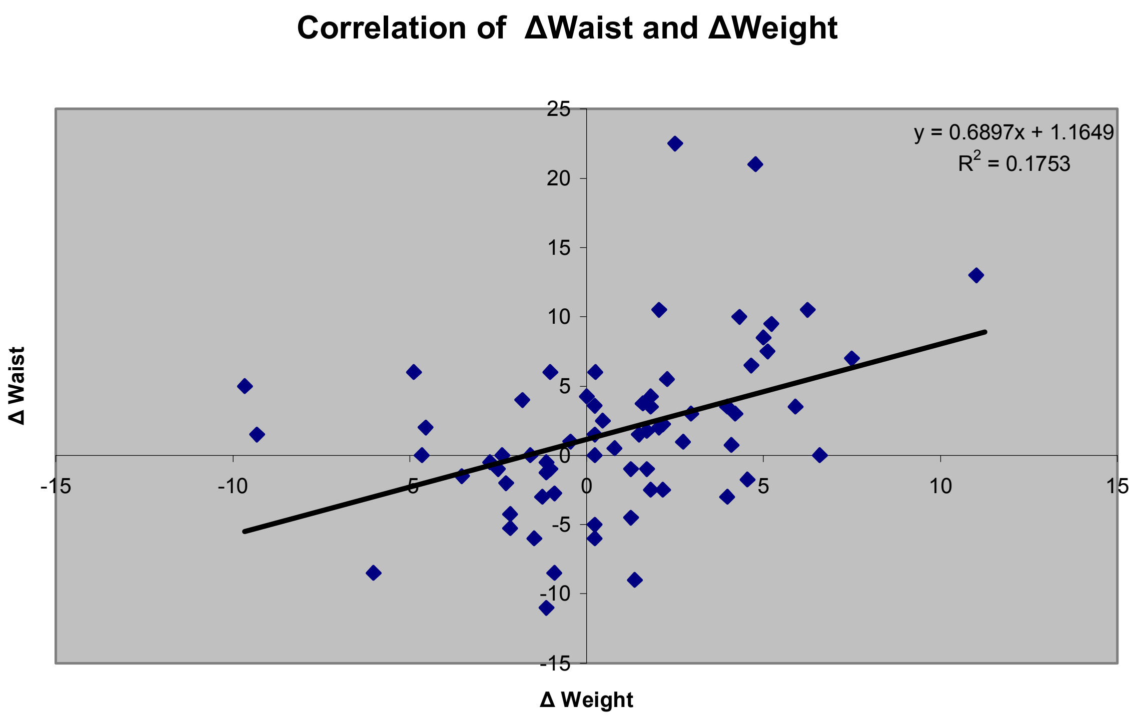


**Figure 3. Correlation of Change in Waist and Change in Weight**

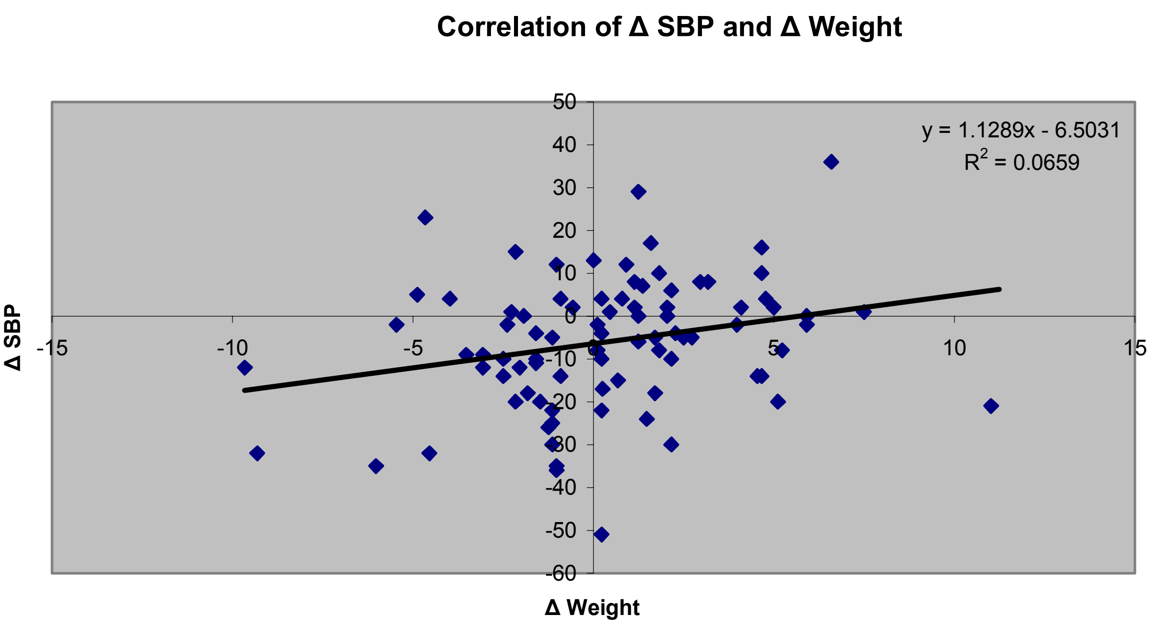


**Figure 4. Correlation of Change in SBP and Change in Weight**

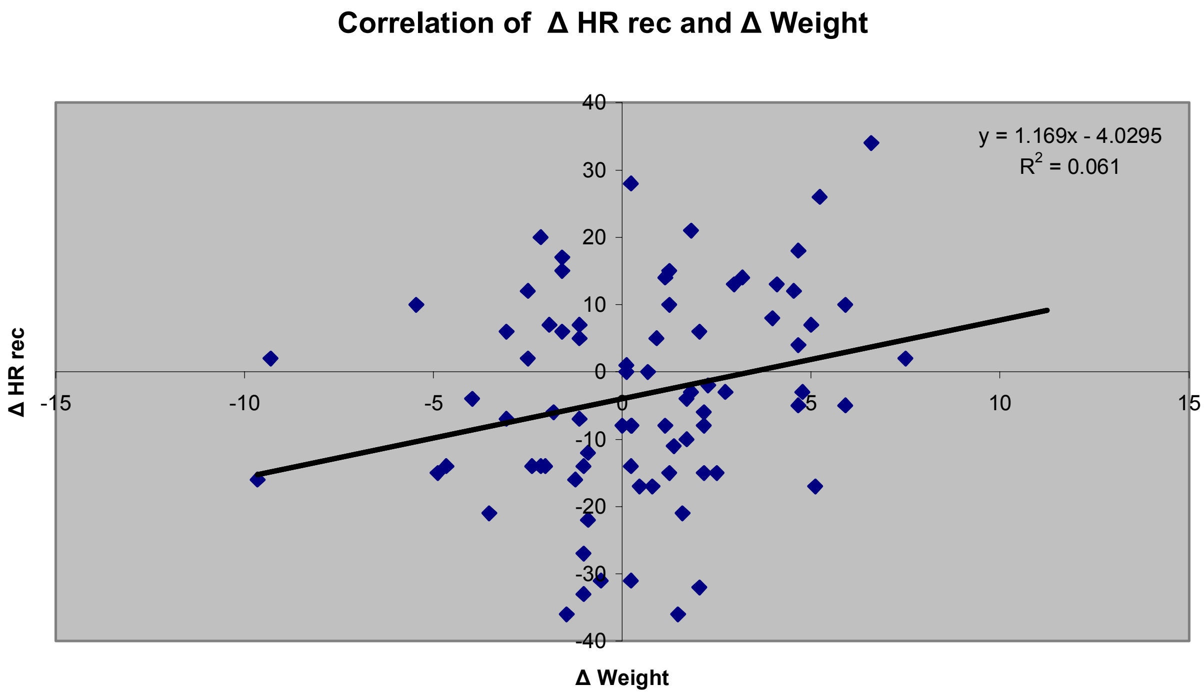


**Figure 5. Correlation of Change in Heart Rate Recovery and Change in Weight**

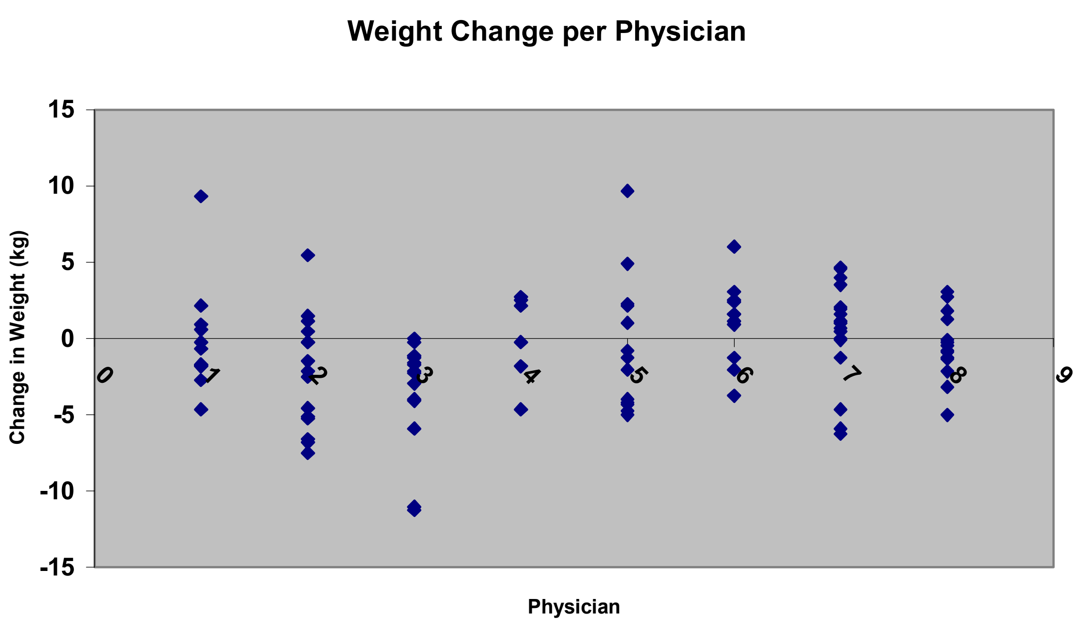


**Figure 6. Change in Weight per Physician**

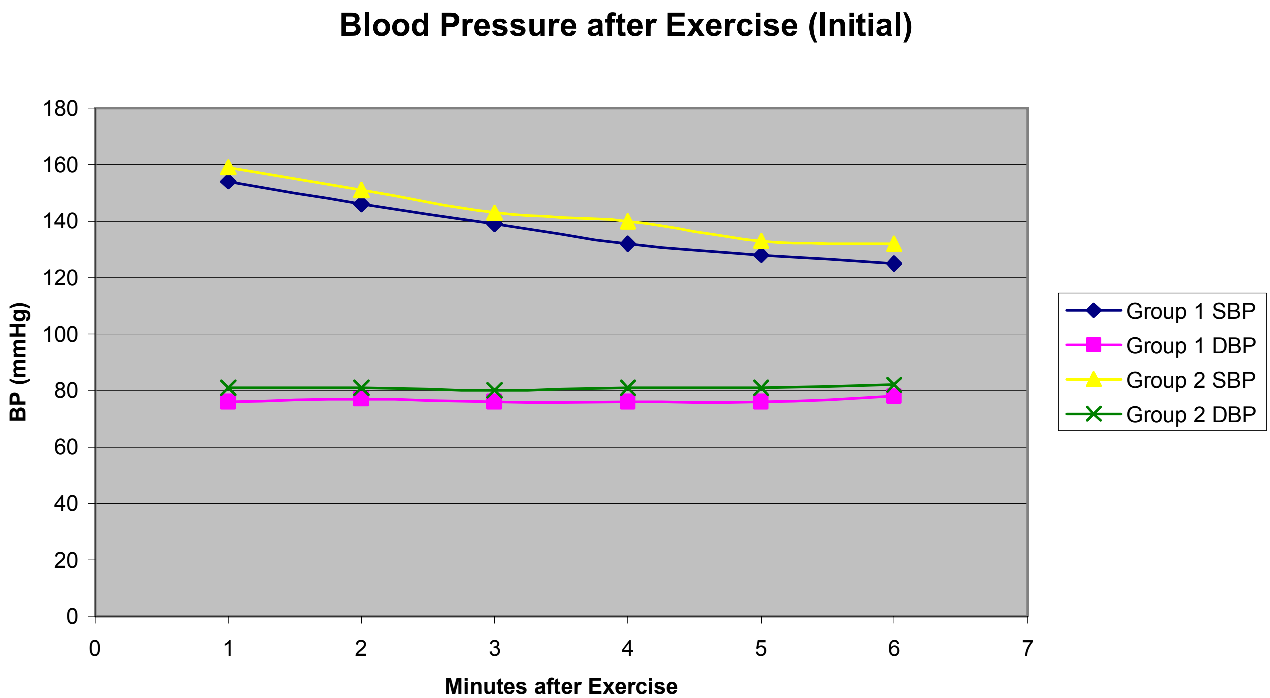


**Figure 7. Initial Serial Blood Pressures after Exercise**

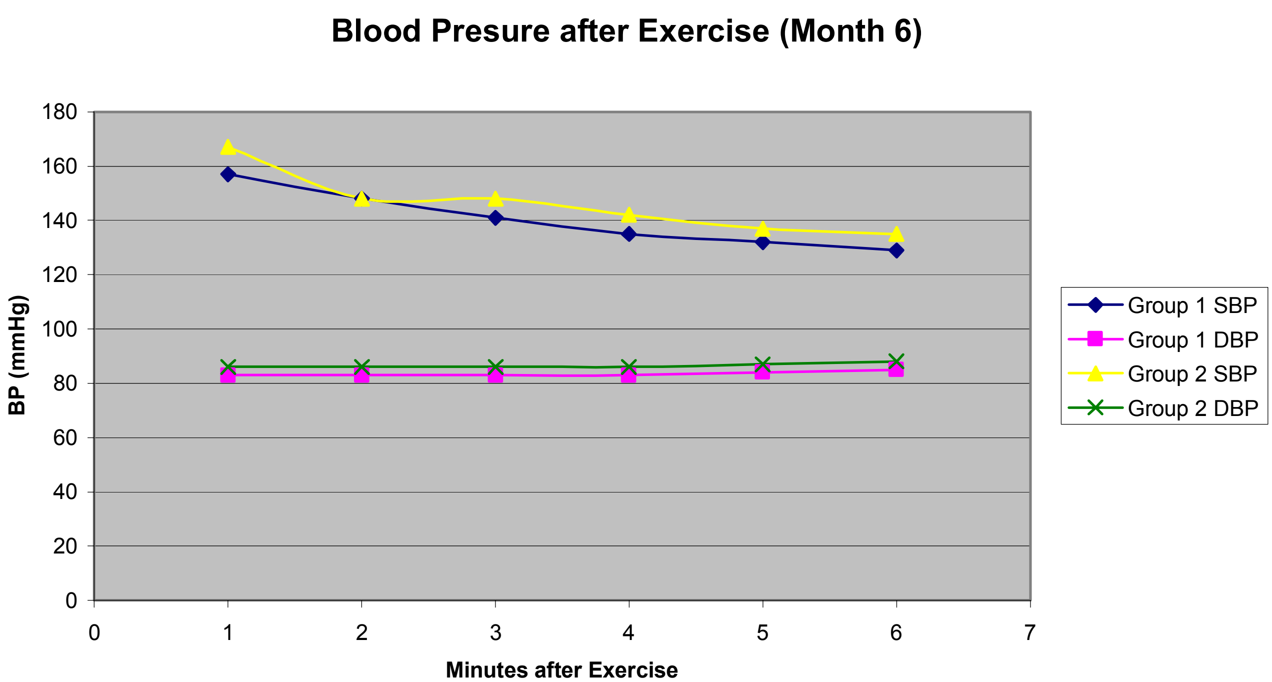


**Figure 8. Serial Blood Pressures after Exercise at Month 6**

# CHAPTER 4 - DISCUSSION

The unique findings of the current study indicate a weight loss following a six-month primary care physician directed weight loss program in an African-American women population (-1.69 kg; p= 0.004). The study was also successful in achieving a substantial decrease in BMI after implementation of the intervention (-3.6 units; p= 0.035). Moreover, the magnitude of weight loss was associated with a more favorable cardiovascular risk factor profile.

Currently, few effective intervention strategies have been shown to treat and control the steady progress of overweight and obesity. This is especially true in African-American women and individuals of lower socioeconomic areas. Because overweight and obesity are significant contributors to the development of many chronic diseases such as cardiovascular disease, hypertension, diabetes, and certain cancers, it is extremely important to focus on identifying effective weight loss intervention components, in particular in under-studied population including African-American women and those from lower socio-economic areas (Bronner, and Boyington, 2002).

**Efficacy of Weight Loss Intervention**

The efficacy of the physician directed program is evident on the basis that the intervention group experienced significant decreases in both weight and BMI compared to the standard care group. However, despite the significant decrease in body weight and BMI, the magnitude of the weight loss is significantly less than what is recommended by the NHLBI. The NHLBI (1998) maintains that a rational time to achieve a 10 percent body weight reduction is 6 months of multi-disciplinary therapy, yet this study only revealed a 2% decrease in body weight over a six-month intervention period. Goldstein (1991) and Atkinson (1993) have reported that a standard for modest, realistic, and still acceptable weight loss for the general population includes a reduction in initial weight of 5 – 15 % over six-months. However, the present findings are quite consistent with previous research conducted on African-American women (Kumanyika et al., 1992; Kanders et al., 1994). Kumanyika and Charleston (1992) obtained about a 2-3% reduction in body weight after two months of weekly intervention sessions. Another study by Kanders et al (1994) achieved a 6-pound reduction in weight over a ten-week period. Several other such programs have achieved less weight loss, only able to obtain an average weight loss of three pounds. An extensive review of eleven similar weight loss studies on African-American women conducted by Bronner et al (2002) revealed weight loss ranging from 0.4 pounds to 10.9 pounds. By obtaining nearly a four-pound loss over six-months of intervention, this study is in line with previous research conducted in African-American populations. The fact that the weight loss seen in this study is significantly less than predicted by the NHLBI may point towards specific barriers, problems, and concerns when dealing with this population. Future programs may need to be more culturally appropriate and thereby meet the needs of African-American women. Some strategies and incentives that may prove beneficial include free transportation, reminder phone calls, baby-sitting, rewards, behavior-specific contingency contracts, home visitation, and police protection for walkers (Bronner et al., 2002).

The clinical relevance of the weight loss observed for the intervention group is not entirely clear. Blackburn et al (1992) have shown that at least a 5% decrease in body weight must occur in order to concurrently achieve changes in cardiovascular risk factors. On the other hand, Anderson and Konz reported that a one kg increase in weight increased CVD risk by about 5%. BMI units in the intervention group decreased by almost 9.5%, which represents over a 3.5 unit decrease. Research by Jousilahti et al (1996) has determined that a 5% decrease in cardiovascular mortality risks exists for every BMI unit loss above 20-24 $kg/m^2$. This indicates a substantial decrease in cardiovascular risk in those receiving the intervention. Further, Anderson and Konz (2001) estimated that for every one-unit higher BMI value, for men or women, the risk for cardiovascular disease increases by about 14%. The standard care group showed a slight average increase in BMI ($0.181 \pm 1.57$), resulting in slight increases in cardiovascular risks. It would appear the observed weight loss might have had a positive effect on cardiovascular risk. This is further emphasized by the observance of a decrease in BMI units.

Changes in cardiovascular fitness, as defined as recovery heart rate, were not observed in the intervention group, despite moderate weight loss and reduction in BMI. This may be due to that although dietary, behavioral, and physical activity tips were specified monthly to participants in the intervention, the only measure to assess whether the advice was being followed were self-reports, which have been shown to be somewhat inaccurate (Jakicic et al. 1998). Further, as reported by the NHLBI, participants undergoing weight loss interventions find it easier to change dietary patterns than change physical activity habits, thus leading to small changes in weight without concomitant changes in fitness status. It has been repeatedly shown that adherence to formal exercise is typically poor, especially in the obese (Leermakers et al., 2000).

When an individual engages in physical activity systolic blood pressure and heart rate will increase while diastolic blood pressure changes little. After an exercise bout, systolic blood pressure may fall below pre-exercise values by 20-30 mmHg in hypertensive men and by about 8-12 mmHg in normotensive men (Brown et al. 1993). Mean reductions in this African-American female population include a 6 point drop for the intervention group and a 5 point decrease in the standard care group at the 6-month visit. According to DiCarlo et al. 1994 and Rueckert et al. 1996, these effects can lasts for 20-120 minutes after exercise. There are many potential mechanisms for this post exercise hypotension, including relaxation and vasodilation of blood vessels in the periphery. Also blood vessels may relax after each exercise session because of body warming, local production of certain chemicals, decreases in nerve activity, and changes in hormones and their receptors (Nieman 1999). Over time, as the exercise is repeated, there is growing evidence that a long lasting reduction in resting blood pressure can be measured. However, most prior studies have been conducted on men and more research is needed in order to examine results obtained on women.

**Weight Loss in Relation to other Physiological Parameters**

A secondary purpose of the study was to determine if the physician directed program was associated with improved risk factor profile. The present findings indicate the magnitude of weight loss was associated with an improved cardiovascular risk profile, but this was independent of the intervention. Thus, those who lost more weight also experienced greater losses in waist circumference, recovery heart rate, and systolic blood pressure. As previously mentioned declines in body weight, BMI, waist circumference, and blood pressure all result in decreased risks for cardiovascular disease. In fact, Jousilhati et al (1996) reported that obesity is the strongest determinant of hypertension; inferring reduction in weight could be the most effective method to prevent hypertension. The present findings indicate an association between the magnitude of weight loss and change in systolic blood pressure, where those with the greatest weight loss also experienced the greatest reduction in resting systolic blood pressure ($r = .251$, $p = .023$). This is in line with Jousilhati et al (1996) who reported that among those with slightly increased blood pressure, long-term intervention with weight loss has been shown to be effective in the prevention of hypertension. Interestingly, this study also suggests those who had the greatest weight loss had the greatest improvement in one-minute heart rate recovery following the step test. Cardiovascular fitness, as determined by the one-minute recovery heart rate has been shown to be associated with cardiovascular mortality; lower post-exercise heart rate indicates lower risk (Cole et al 1999). Whether the observed associations are a reflection of an increase in fitness due to increases in activity or a decrease in body weight or a combination of the two, it is not clear given the self-reports were somewhat unreliable.

Those individuals who lost more weight experienced improvements in cardiovascular risks, despite being assigned to the intervention or standard care group. This may have been dependent on the ability of the physician to adequately deliver the weight loss intervention. Further analysis did reveal the magnitude of weight loss appears to be dependent on the physician responsible for the delivery (Average weight change: MD1: -0.44; MD2: -4.97; MD3: -7.43; MD4: 0.25 lbs). Additional analysis disclosed that the weight loss achieved by MD 3 was significantly different from all other physicians except MD 2 ($p = 0.001 – 0.030$), with none of the subjects receiving intervention from MD 3 gaining any weight. Graph 6 indicates the magnitude of weight change attained by each physician, clearly indicating the success of the ability of the intervention physicians to achieve greater average weight losses. This may signify that physician appearance, gender, race, delivery technique, genuine concern for patient, and personality may serve as a strong indicator of whether successful weight loss will be obtained.

**Possible Predictors of Successful Weight Loss**

Another secondary purpose of the study was to determine if certain initial characteristics, such as BMI, initial heart rate recovery, and blood pressure, could predict overall success in weight loss. Findings associations between initial characteristics and successful weight loss would assist clinicians in being able to identify those patients who may need more specific attention. If baseline characteristics indicate one's ability to successfully lose weight, health professionals would be able to take a more aggressive and appropriate approach in order to better assist in weight reduction. If the clinician would be able to take simple initial measures such as BMI, heart rate recovery, or blood pressure, and devise a more dynamic approach to weight loss, then time, money, and patient frustration, could be greatly minimized while weight loss success maximized. In order to form conclusions on this matter, all of the participants were grouped into tertiles within the population, i.e. BMI groups; highest, middle, and lowest. Descriptive statistics and an ANOVA were conducted for all categories and groups, and no relationship was discovered. The results were unable to show any relationship between initial predictor characteristics and successful weight loss. However, certain other variables, such as socioeconomic status, transportation accessibility, family unit and structure, and motivation, might provide greater predictor information.

**Limitations**

The present study possesses several limitations that may have influenced the study's outcome. One limitation includes the subjectivity of the self-report measures that were used to assess physical activity and dietary patterns. Not being able to objectively evaluate exercise habits leads to patient overestimate of physical activity. Also, the use of a three-minute step test to evaluate fitness may be a limiting factor to this study. Research has shown that the step test has only been proven valid for apparently healthy populations, whereas our population had elevated cardiovascular risks.

Further this study was limited to African-American women who were from lower socio-economic areas. It has been shown that this population is in fact has the highest prevalence of obesity. Although, as previously mentioned, there has been shown to be some moderate success with weight reduction in this population, there are still many barriers that need to be addressed.

Another such limitation includes the study's inability to accurately assess if the physician's were appropriately implementing the intervention as they were trained. It was not possible to determine if the intervention physicians were adequately implementing procedure just as it was not possible to ensure the standard care physicians were not providing their patients with weight loss information.

Other limitations include the inconsistency in the comprehension levels of the participants and there currently is not an accurate method of determining if patients completely understood the intervention advice. Also there was no well-established follow-up protocol regarding caloric intake and actual exercise performed. Inability to assess caloric intake restricted our ability to take intake into account.

Future studies need to consider the many barriers faced by this population. Addressing physician barriers including lack of time, patient non-compliance, inadequate teaching materials, lack of counseling training, inadequate reimbursement, and low physician confidence are imperative to ensure success. Future programs need to be more culturally appropriate and thereby meet the needs of African-American women. Some strategies and incentives that may prove beneficial include free transportation, reminder phone calls, baby-sitting, rewards, behavior-specific contingency contracts, home visitation, and police protection for walkers.

**Conclusion**

In conclusion, the present model was effective in achieving significant weight loss in the intervention participants during a 6-month period. Though, the magnitude of weight loss was not enough to attain decreases in cardiovascular risks, the intervention group did not experience increases in risks, as did the control group. However, the reduction in BMI was significant and also resulted in decreased cardiovascular risk. Importantly, those individuals who lost more weight independent of the intervention also achieved greater reduction in waist circumference, recovery heart rate, and systolic blood pressure. Finally, this study was unsuccessful in determining whether certain individual initial characteristics could influence the prediction of successful weight loss.

Through the assessment of weight, BMI, blood pressure, and fitness, as well counseling, support, and monitoring, primary care physicians have a valuable opportunity to educate patients on the significance of maintaining a healthy weight and to inspire them in healthy weight management. A multi-disciplinary approach allows the physician and the patient the opportunity to work within a system of valuable resources to treat the chronic disease of obesity and its comorbidities.

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# APPENDIX: REVIEW OF LITERATURE

## Causes of Obesity

Causes of obesity have been thoroughly researched and the consensus is that obesity can be caused by environmental, genetic, behavioral, and cultural factors as well as physiological factors. More often than not, there is a combination of factors that are linked to obesity.

### Environment

A change in environment is one factor responsible for the large increase in the prevalence of fatness of the population (Hill, et al., 2000). Regardless of one's perception about obesity, it is near impossible to escape the fact that the obesity epidemic is in part caused by the environment (Schmitz, et al., 2000). It seems as though our environment is now more obesity promoting than it has been in previous years. It is suggested that the environment makes if quite difficult to restrict energy intake, in fact it promotes greater food intake (Hill, et al., 2000). Our current environment is one in which food is easily accessible and relatively inexpensive. It is important to understand that one or two environmental factors cannot be to blame for the increases in obesity, but we must look at many factors involved and requires more research.

### Genetics

Even with environment as a major factor in obesity, we see certain variations in body fatness within the same environment (Hill, et al., 2000). This variation may be substantially related to genetics. Research studies have shown high correlations of body mass index between first-degree relatives. Most of the previous studies done examined genetic defects in metabolism that predispose them to obesity. Other studies have suggested that the inability to oxidize fat may predispose individuals to obesity (Hill, et al., 2000).

### Behavioral

Eating, activity patterns, and thinking habits greatly contribute to weight gain and obesity (Wadden and Foster, 2000). The way individuals think about and perceive food can attenuate over eating that leads to weight gain. Lack of education on healthy eating patterns and proper and adequate exercise has been shown to increase the chance for obesity. There is virtually no question that a combination of high calorie diets and lack of physical activity cause weight gain.

### Cultural

Research has shown that minority populations, especially African-American woman, are less likely to adequately exercise or eat healthy (Kumanyika, et al., 1992). African-American women do in fact tend to have higher caloric intakes and prefer foods that are higher in calories and fat than do Caucasians (Swanson, Gridley et al., 1993). Cultural preferences and availability of foods may greatly increase the likelihood of gaining weight and becoming obese.

## Diseases Associated with Obesity

The negative effect of obesity on health and longevity is well documented (Jousilahti, Tuomilehto, Vartiainen, Pekkanen, and Puska, 1996). Obesity is closely related to several known cardiovascular disease risk factors, such as hypertension, lipid abnormalities, and impaired glucose metabolism. Obese individuals tend to have higher blood pressure, higher serum total cholesterol, lower HDL-cholesterol, higher serum triglycerides, and higher blood glucose as compared to lean individuals (Eckel, 1997). Obesity has also been associated with increased risk for a large number of disorders including, but not limited to, type II diabetes, hypertension, coronary heart disease, congestive heart failure, osteoarthritis, cancers such as prostate, breast, colon and endometrial, sleep apnea, respiratory disorders, gallstones, and depression (Allison, et al., 2000).

### Dyslipidemia

Obesity is linked with dyslipidemia in more than one way. Excessive body weight is associated with high total cholesterol, high low-density lipoproteins, low high-density lipoproteins, and high triglycerides (Allison, et al., 2000). There is a direct relationship between BMI and blood cholesterol. Cross sectional studies have shown that a 10-unit increase in BMI may result in a substantial increase in LDL cholesterol (Allison, et al., 2000). HDL cholesterol tends to decrease with increasing stages of obesity, and changes are more pronounced in women (Krauss, Winston, Fletcher, and Grundy, 1998). Further, central obesity in women is associated with elevated LDL cholesterol concentrations.

### Type II Diabetes

Type II diabetes has been associated with increased adiposity in a number of studies (Allison, et al., 2000). It has been estimated that 90% of those with type II diabetes are obese. Obesity is strongly related to insulin resistance and has been shown that excessive adipose tissue is associated with increased insulin resistance (Allison, et al., 2000). Investigators have reported that a weight loss of as little as 5 – 10% of initial body weight can reduce the risk factors for type II diabetes (Van Gaal, Wauters, and Leeuw, 1997).

### Hypertension

Increasing adiposity contributes to a rise in the incidence of coronary heart disease through elevated blood pressure as well as other factors (Tonstad and Graff-Iversen, 2001). There is a direct relationship between increases in BMI and increases in blood pressure. There are some incompletely understood aspects of the relationship between obesity and hypertension, such as body fat and body composition effects (Allison et al., 2000). One aspect that is clear is that weight loss is clearly associated with decreased blood pressure.

**Coronary Heart Disease**

Body mass index is positively and independently associated with morbidity and mortality from cardiovascular disease (Bell, Adair, and Popkin, 2002). Coronary heart disease mortality increases about 5% for every BMI unit beginning at a BMI of 20-24 kg/m². Coronary heart disease is linked to many risk factors, including elevated cholesterol, hypertension, and elevated insulin levels, which are all associated with obesity (Allison, et al., 2000). Further, increased fat in the abdominal area has been shown to have a positive correlation to morbidity and mortality for coronary heart disease.

**Osteoarthritis**

Several studies have indicated that an increased BMI may lead to increased rates of osteoarthritis in weight bearing joints. The rationale behind the relationship is not completely understood but is linked to excess strain and weight on the joints (Allison, et al., 2000). A decrease in BMI of 2 units or more, or weight loss of approximately 5.1 kg, decreased the risk for developing osteoarthritis by over 50% (Felson, Zhang, Anthony, Naimark, and Anderson, 1992).

**Cancer**

Obesity has been associated with breast cancer in postmenopausal women (Allison, et al., 2000), especially with abdominal adiposity (Hunter and Willett, 1993). This may in part be due to the fact that adipose tissue is a source of estrogen. It has been showed that high levels of estrogen may be linked to breast cancer.

Colon cancer in men and women has been highly correlated with obesity and BMI (Allison, et al., 2000). Men above the fourth quintile for BMI are shown to have a 1.96 odds ratio for developing colon cancer and women have a 1.54 odds ratio (Allison, et al, 2000).

Endometrial cancer has been associated in women who have a BMI greater or equal to 30. Development of the disease is three times greater than that of non-obese women (Allison, et al., 2000). Increased risk for endometrial cancer increases as weight increases.

### Sleep Apnea and Respiratory Disorders

Sleep apnea is characterized by hypertension, sleep arousal, cardiac arrhythmia, and arterial hypoxia (Allison, et al., 2000). Research has shown that approximately 24% of men and 9% of women, who are overweight, experience sleep apnea and difficult breathing. It has been shown however that weight loss is an effective treatment for sleep apnea.

### Gallstones

For women, lesser for men, obesity is a strong risk factor for gallstones, however this risk is increased during weight loss (Everhart, 1993). It has been shown that there is a substantial increase in the incidence of gallstone disease with increasing BMI and especially among women with a BMI of at least 30kg/m$^2$ (Everhart, 1993).

## Treatment Strategies for Obesity

### Pharmacotherapy

Pharmacological agents that act to encourage weight loss have been available for many years and there is a steady rise in interest in identifying drugs that are effective against obesity (Hensrud, 2000). In certain patients, use of pharmacotherapy in conjunction with proper lifestyle therapy may be appropriate (Rippe, et al., 1998). Most of the current as well as drugs of the past, affect the central nervous system by potentiating noradrenergic or serotoninergic neurotransmission (Hensrud, 2000). Certain drugs such as fenfluramine and dexfenfluramine work to primarily increase the release of serotonin in brain synapses. One study showed that 84% of the participants lost 10% of their body weight in about 4 months on these drugs (Hensrud, 2000).

Other drugs, such as amphetamine and phenmetrazine,  are anorectic drugs that work to diminish appetite leading to reduction in food intake, which over time may lead to weight loss (Scheen and Lefebvre, 1999).  These drugs function by release of  norepinephrine or block its reuptake into neurons in the hypothalamus.

In some cases of obesity an individual may exhibit impaired thermeogenesis.  A pharmacological stimulation of thermeogenesis appears to be a rational target to alleviate obesity (Scheen, et a., 1999).  Some research studies suggest that some anti-obesity drugs work by increasing resting metabolic rate while others report increased dietary induced thermeogenesis (Atkinson, 1997).  One very popular drug is ephedrine, which increases metabolic rate probably by stimulating beta-3 adrenergic receptors (Scheen, et al., 1999).

Drugs that affect nutrient partitioning have also been developed.  These drugs can act several different ways.  Medications, such as amylin derivatives, have been developed to inhibit gastric emptying.  These cause increases in satiety directly and via intestinal hormones (Scheen, et al., 1999).  Secondly, a direct approach to reduce caloric absorption inhibits nutrient digestion. Drugs like orlistat, on average, block approximately 30% of ingested dietary fat (Hensrud, 2000). However, adverse events occurred in about 20% of the studies participants.

Anti-obesity drugs have only been shown to achieve modest weight loss when used for treatment without other treatment strategies.  However, certain pharmacological agents have been shown to reduce obesity related risk factors.

**Dietary Approaches**

The growing number of obese individuals is growing rapidly in the U.S. and is due primarily to consumption of more calories than is expended (Rolls and Bell, 2000).  In order to lose weight, there must be an energy deficit where intake is less then expenditure.  Fat restriction is often advocated for controlling body weight. However, many nutritionists urge permanent adoption of low fat diets to achieve weight loss and maintenance (Rolls, et al., 2000). The National Institute of Health (NIH) critically evaluated evidence from many trials in order to assess optimal approaches to reduce obesity by dietary modifications.

The NIH addressed several factors that need to be considered when wanting to reduce weight by dietary approaches. Optimal calorie levels to achieve weight loss was thoroughly examined and the panel found that there is strong evidence that low-calorie diets that consist of approximately 1000 – 1200 kcal/day can reduce body weight by an average of 8% over 3 to 12 months (Rolls, et al., 2000). Very low-calorie diets that provide about 400-500 kcal/day produce greater weight loss, but long-term maintenance was no different (Rolls, et al., 2000).

Optimal diet composition was also examined and focused mostly on the amount of fat in the diet. Research shows that lower-fat diets, which consist of about 20-30% of calories, promote weight loss (Rolls, et al., 2000). Greater weight loss has been shown when fat reduction is coupled with reduction in total energy intake.

Weight maintenance is also an extremely important factor to examine in order to ensure health benefits are long lasting. After 6 months, rate of weight loss usually declines and body weight reaches plateau. The NIH defines weight maintenance as less than a 3 kg regain in 2 years (Rolls, et al., 2000).

Overall, studies have indicated it would seem that the individualized modification of lifestyle by a reduction of fat intake, an increase in complex carbohydrates, and participation in regular vigorous physical activity has the greatest potential to favor weight reduction and stability (Doucet, Imbeault, Almeras, and Tremblay, 1999).

**Exercise Therapy**

Many causes for the increases in the prevalence of obesity have been noted over the past few decades. Available data in relative populations has shown that caloric intake per capita over the last decade has not significantly increased, so this would lead us to believe that declines in physical activity may be the most likely culprits (Leermakers, Dunn, And Blair, 2000). Sufficient data has been collected that indicates that exercise delays or prevents the weight gain that often occurs with aging (Leermakers, et al., 2000). Physical activity allows for a negative energy balance to be obtained, which can lead to weight loss over time. Research studies have shown that those who exercise maintain weight loss better than those who do not exercise (Ewbank, Darga, and Lucas, 1995). The primary goal of obesity reduction programs, as suggested by recent research studies, should be to maximize fat loss since this yields the greatest reduction in coronary heart disease risk (Ballor and Poehlman, 1994). Currently exercise recommendations are established by the American College of Sports Medicine and implement a moderate intensity program. Additionally, research conducted to test the effects of intensity on body composition has shown that intensity level did not play a factor in effecting body composition in untrained moderately overweight women (Grediagin, Cody, Rupp, Benardot, and Shern, 1995).

More than any other treatment modality, exercise has been shown to stimulate long-term weight loss when implemented independently. Ewbank et al. (1995) have demonstrated that those who expend over 1500 kcal per week through exercise regained significantly less weight two years after treatment than those who modified their diet only. However, studies have indicated that when caloric restriction and physical activity are used as treatment strategies together, weight loss was significantly greater than either modality independently (Garrow and Summerball, 1995).

### Surgical Treatment

Surgical procedures to treat obesity are usually only implemented when an individual is classified as morbidly obese. Patients are considered morbid obese when they are 100% or greater above their ideal body weight (Balsiger, Murr, Poggio, and Sarr, 2000). However, morbid obese can also include individuals who have direct weight related serious morbidities, such as mechanical atrophy, hypertension, type II diabetes, lipid-related cardiac disease, and sleep apnea (Balsiger, et al., 2000).

There are four basic approaches that have been used to design operations to induce weight loss. These include global malabsorption, gastric restriction, combined gastric restriction and dumping physiology, and selective maldigestion and malabsorption (Balsiger, et al., 2000). All of the procedures involve either bypassing certain areas in the intestinal tract, restricting areas, reducing the size of the digestive tract, or a combination of these methods. Goals of a surgical procedure to reduce weight should be to induce and maintain permanent loss of at least half of the preoperative excess body weight. Also reversal of most or all of the weight-related comorbidities is a primary goal (Balsiger, et al., 2000). It is extremely important before as well as after a surgical procedure that the individual be counseled. This usually involves a team approach that includes the physician, dietician, psychologists, and an experienced surgeon (Balsiger, et al., 2000). Appropriate dietary, exercise, and self-assessment education must be implemented to the patient to help insure success.

### Multidimensional/Behavioral Programs

For many years, research in the field of weight management has been largely based on one-dimensional programs. The long-term success rate of these programs has been shown to be low (Senekal, Albertse, Momberg, Groenewald, and Visser, 1999). Behavioral approaches are based on the assumption that to lose weight, patients must decrease their caloric intake and increase their physical activity (Wing, 1992). Behavioral multidimensional treatment strategies usually include multiple components, such as self-monitoring, nutrition, stimulus control, slowing eating, exercise, problem solving, and cognitive restructuring (Wadden, et al., 2000). For many women, the first objective in long-term weight management is the formulation of a reasonable weight goal. The goal should be individualized, realistic, achievable, maintainable, and contributes to well being (Senekal, et al., 1999). The ultimate goal for a multidimensional weight loss program should be to produce lifelong habit change and hence permanent weight loss (Wing, 1992).

Self-monitoring is the cornerstone of behavioral treatment (Wadden, et al., 2000). The focus of this aspect can be on eating, exercise, and thinking patterns, but mostly emphasizes food intake. When implementing these methods patients are encouraged to keep daily logs which will allow a visual cue to reduce food intake (Wadden, et al., 2000).

The approach usually taken to inform patients of exercise emphasizes that some exercise is better than none. Rather then trying to reach certain thresholds, efforts are made to simple increase activity (Wadden et al., 2000). Attempts are made to incorporate lifestyle activities such as taking stairs, walking more, and parking further away into the program. The primary goal of lifestyle activity is to increase the amount of energy expended daily, without the concern for the intensity of activity (Wadden, et al., 2000).

Cognitive restructuring functions to teach patients to identify, challenge, and correct thoughts that are irrational and frequently undermine weight control efforts (Wadden, et al., 2000). Most frequently, dealing with thoughts of set backs and not achieving desired weight loss are responsible for inadequate weight control. It has been shown that before treatment, on average patients chose weight loss goals of 32% reduction in body weight. Weight losses achieved that were 25% of body weight were deemed acceptable, whereas a 17% weight loss was seen as disappointing (Wadden, et al., 2000). Educating patients on realistic goal setting has become a principal concern in behavioral treatments for weight control.

Results of behavioral treatments for obesity have revealed that weight losses have doubled over the last couple of decades as treatment duration has doubled (Wadden, et al., 2000). However, it has typically been shown that most patients regain approximately 30% of their weight loss within one year after treatment, and about 50% of the patients are back to baseline weight within 5 years (Wadden, et al., 2000). Interestingly, with long-term treatment, in the form of behavior treatment, pharmacotherapy, or a combination, the maintenance of weight loss improves significantly.

# VITA

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